18th IAA SYMPOSIUM ON SPACE DEBRIS (A6)
Space Debris Detection, Tracking and Characterization (1)

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CORRELATION BETWEEN LIGHT CURVE OBSERVATIONS AND LABORATORY EXPERIMENTS USING A DEBRIS SCALE MODEL IN AN OPTICAL SIMULATOR

Abstract

Active debris removal (ADR) is one of the most promising methods to secure the space environment from space debris. In order to carry out ADR mission, the attitude and motion of the target should be understood precisely. If we establish the technologies for extracting these values only from the light curve, it may be the powerful solution. We started the light curve observations of the ADR candidates, H2A R/Bs, 2nd stages of Japanese H2A rockets using the 60cm telescope and the CMOS sensor. We developed the optical settings in the laboratory to simulate the light curve. We can simulate the exact light curve data using the scale model of H2A R/B. The settings consider the attitude, motion and lighting condition of the H2A R/B. We found two extremely strong peaks in the observed light curve of one of H2A R/B (SSC:39771) in March 19th of 2019. We simulated the two light curves using the optical settings. One case is the nozzle directs to the earth under the gravity gradient stabilization. The other is the payload attach fitting directs to the earth. The results of simulations showed that the latter case perfectly matched the observed light curve. We found a few degrees tilt of the target causes the shifts of peak times. This means the attitude of the target may be understood using the peak time in some cases. Although this is one case out of countless situations, simulating exactly same light curve is the one step toward the total understanding of the ADR targets from light curves. We also developed the light curve simulation tool using CGs. We can estimate the overall tendency of the light curve using this tool which will dramatically reduce experimental times for the simulation of the light curve using the optical settings.